The Privilege of Proton Magnetic Resonance Spectroscopy in Evaluating Ovarian Tumors

Thesis

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بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

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Noor Laith Salman

Dedication

This work is dedicated to . . .

My beloved Father, to whom I owe everything I ever did in my life and will achieve.

My Mother for always being there for me and all the nights she stayed with me.

My Brother and My Sister for their support

My Husband for being the light of my life and God's gift to me, my backbone

Finally My Lovely Kids Jana & Qamar

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List of Abbreviations

Abb.	Full term
Ala	*Alanine*
BOLD	*Blood oxygen level–dependent*
Cc	*Choriocarcinoma*
CHESS	*Chemical-shift selective suppression*
Cho	*Choline*
Cr	*Creatine*
CSI	*Chemical shift imaging*
DCE-MRI	*Dynamic contrast-enhanced MRI*
DWI	*Diffusion-weighted imaging*
EC	*Embryonal carcinoma*
FIGO	*Federation of Obstetrics and Gynecology*
GCTs	*Germ cell tumors*
Hz	*Hertz*
ISIS	*Image Selected In Vivo Spectroscopy*
MCTs	*Mature cystic teratomas*
MR	*Magnetic resonance*
MRI	*Magnetic resonance imaging*
MRS	*Magnetic resonance spectroscopy*
NAA	*N-acetyl aspartate*
OGCTs	*Ovarian germ cell tumors*
OSE	*Ovarian surface epithelial*
PRESS	*Point Resolved Spectroscopy*
RF	*Radiofrequencies*
ROI	*Regions of interest*
S/N	*Signal to noise ratio*
SI	*Spectroscopic imaging*
STEAM	*Stimulated Echo Acquisition Mode*
SV	*Single-voxel*
TOA	*Tubo-ovarian abscesses*
WHO	*World health organization*
YST	*Yolk sac tumors*

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Introduction

Ovarian masses account for most common indication for gynecological surgery, but definitive diagnosis is not possible until the surgery and histopathological examination have been performed. However, the preoperative characterization of the lesion is crucial to decide the type of surgery and feasibility of conservative management and probability of malignancy, which is based mostly on imaging appearance ***(Sampathi and Sindhu, 2017).***

The optimal assessment of an adnexal mass requires a multidisciplinary approach, based on physical examination, laboratory tests and imaging techniques. An important issue to consider in the management of ovarian masses is that they are very common, but most of them are benign and only a small part is borderline or malignant. Preoperative biopsy should not be performed in ovarian masses, particularly if the mass appears to be surgically resectable at the moment, as this invasive procedure raises the risk of spreading cancer cells and potentially leads to iatrogenic upstaging worsening the prognosis. So diagnostic imaging plays a crucial role in detection, characterization and staging of adnexal masses ***(Foti et al., 2016).*** However, the only definitive diagnosis of an ovarian masses is through histology ***(Yeoh, 2015).***

Several imaging modalities are available for detecting ovarian tumors; however there is no single reliable diagnostic method. Ultrasonography plays a pivotal role in detecting ovarian lesions and differentiates solid, cystic and complex cystic lesions

With its multiplanar capability, superior tissue contrast and different sequences, MRI becomes a crucial method of investigation of ovarian lesions. MRI has high sensitivity (97%) and specificity (84%) ***(Mohaghegh and Rockall, 2012).***

Magnetic resonance (MR) imaging may provide useful information for the characterization of ovarian masses as non-neoplastic or neoplastic, and, in the latter case, as benign or malignant ***(Sampathi and Sindhu, 2017).***

Therefore, radiologists play an important role in the multidisciplinary approach of ovarian mass, and, though different pathological conditions may have similar radiologic manifestations, they should be aware of MR imaging features of ovarian lesions that may orientate the differential diagnosis ***(Foti et al., 2016).***

Magnetic resonance imaging, MRI, provides high spatial resolution, such that morphology is very well visualized. With the aid of magnetic resonance imaging (MRI), adnexal masses with morphological characteristic that are indeterminate on trans vaginal ultra sound can sometimes be better identified as benign or malignant, and with magnetic resonance spectroscopy it become possible to go beyond anatomy to assess the metabolic features of tissues or organs ***(Belkić and Belkić, 2017).***

MRS is a non-invasive technique that enables the detection, identification, and quantification of biochemical compounds or metabolites in the tissues. Metabolites that can be measured using 1H-MRS include N-acetyl aspartate (NAA), choline (Cho), creatine (Cr), lactate, glutamine, glutamate, lipids, and macromolecules ***(Sidek et al., 2016).***

MRS patterns of benign and malignant adnexal tumors differ. The choline-to-creatine ratio can help clinicians differentiate benign from malignant tumors with 94.1% sensitivity, and 97.1% specificity ***(Ma et al., 2015).***

Aim of the Work

The aim of our study is to highlight the role of magnetic resonance spectroscopy as a non-invasive technique which may effectively assist in differentiating benign from malignant ovarian masses.